Unexpected Interactions: The Effect of Manipulation Figures on Narrative Engagement in Digital Literature

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Abstract

Digital literary works frequently experiment with utilizing new media characteristics, such as interactivity. When a human-computer interaction is experienced as unexpected, the interactor may interpret manipulation figures by assigning meaning to the performed gesture. In an experimental 2x2 between-subjects design, this study examined the extent to which narrative-congruent non-conventional interactions in computer-based literary works influenced narrative engagement. Moreover, it was tested to what extent this relation was mediated by perceived disfluency and manipulation figures interpretation. Findings suggested that non-conventional interactions stimulate the interpretation of manipulation figures, which supports the suggestion that manipulation figures arise when the interactor experiences an unexpected gap. In turn, manipulation figures slightly increased narrative engagement. Other hypotheses failed to provide a significant outcome due to constraints in design choices regarding the digital literary work. Since the current study explored uncharted relations between well-known psychological concepts concerning a novel digital literary work, future studies may continue this empirical line of research, ultimately informing design decisions.

Keywords: digital literature, interactivity, manipulation figures, processing fluency, disfluency, narrative engagement

Contents

Introduction

A bookworm is defined as a person who reads a lot (Cambridge University Press, n.d.). This expression implies that reading is done through the use of books, archetypically paperbacks or hardcovers (Skains, 2010). However, long before the existence of books as we know them today, written media included a.o. rocks surfaces, clay tablets, and metal plates (Mugo, Muthwii, & Maina, 2014). In contemporary society, new media such as websites, video games, and virtual reality environments provide novel opportunities for writing as well. In the field of digital literature, new media features are utilized to exploit literariness (Bouchardon, 2016). That is, multimodal dimensions such as geolocalization, text animation, and interactivity are applied to transform the literary experience (Bouchardon, 2018a).

By definition, works of digital literature are born digital, meaning they cannot be presented in a printed format without partially losing their meaning (Simanowski, 2011). Following this rhetoric, an e-book is thus not considered to be a work of digital literature (Simanowski, 2010). Utilizing a key characteristic of new media, most digital literary works require some sort of interaction (Wardrip-Fruin, 2015). Here, an interaction is defined as a state change of the work, for which it was designed, activated externally (Wardrip-Fruin, 2013). In the current research, we refer to this external activator as an interactor. In a digital literary work, the interactor interacts with a narrative, which is defined as a representation of events that is independent of the medium (Kinnebrock & Bilandzic, 2006). In other words, a narrative comprises a story (i.e. a sequence of events) and the way it is told (Kinnebrock & Bilandzic, 2006).

Loss of Grasp (2010) is an example of an interactive digital narrative about a person who is losing grasp on their life. As the interactor hovers over the sentences on the screen, the story unfolds. Once the sentence “Everything escapes me” vanishes, the mouse cursor disappears. The interactor continues reading the story by hovering the cursor back and forth, without a point of reference. Hence, the interactor experiences the character’s loss of grasp.

The previous example employs a design strategy called *non-conventional media* *coupling*, which causes a gap between the interactor's expectations and the interaction's result (Bouchardon, 2014). In turn, the interactor may interpret this de-coherence by assigning meaning to the performed gesture, otherwise known as interpreting *manipulation figures* (Saemmer, 2012). Here, manipulations are described as the interactor's gestures or actions that are frequently necessary to advance through the digital work (Bouchardon, 2014). Figures are any effect of meaning coming from the combination of manipulation, animation, and textual contents (Saemmer, 2012). Hence, a designer can implement non-conventional media couplings to give rise to manipulation figures, which the interactor may adopt to resolve their unexpected experience.

In the example of Loss of Grasp (2010), when the interactor loses their point of reference due to the disappearing cursor, they may explain this de-coherence by interpreting a manipulation figure, linking their experience to the title of the story. Saemmer (2012) rightfully asks how one can identify whether an event is de-coherent within a field that is too young and evolutive to establish norms regarding what is conventional. Nonetheless, interactions can be considered conventional based on perceived affordances in screen-based interfaces (Norman, 2004).

Affordances in design are defined as action possibilities (Norman, 1988). A computer mouse, for example, affords clicking and pointing (Norman, 1999). Affordances play a central role in interaction design, where good design is considered intuitive (Kaptelinin, 2002). In screen-based interfaces, designers can only control perceived affordances, which are based on learned effects of user actions (Norman, 2004). The mouse cursor shape for example, is a learned convention (Norman, 1999). For instance, if the cursor is shaped like a capital I, the text is perceived to afford selection, whereas a hand-like icon usually indicates that the text is clickable. Hence, the interactor has certain expectations based on their previous experiences with a computer. It seems intuitively likely that contradicting such conventions may have an effect on how people process and engage with literary works.

Busselle and Bilandzic (2009) introduced the construct narrative engagement, which is the sensation one experiences while engaging with a narrative. This sensation comprises four dimensions: narrative understanding, attentional focus, emotional engagement, and narrative presence. The construct has been found to predict feelings of enjoyment and story-consistent attitudes (Busselle & Bilandzic, 2009). Moreover, narrative engagement is founded upon the common psychological mechanism of constructing mental models (Bilandzic, Sukalla, Schnell, Hastall, & Busselle, 2019). Mental models are internal representations containing knowledge about the external world (Johnson-Laird, 1985). In the process of constructing mental models whilst reading, interactors derive meaning from the narrative (Busselle & Bilandzic, 2008). Perhaps, interpreting manipulation figures could enhance narrative engagement through applying and strengthening mental models.

Nonetheless, non-conventional media coupling is also expected to cause some difficulty when processing the narrative. Processing fluency is the subjective ease experienced when processing information (Alter & Oppenheimer, 2009). At first glance, fluency may seem preferable, but in some cases disfluency is a desirable difficulty (Pieger, Mengelkamp, & Bannert, 2018). If task completion is perceived as disfluent, one is more likely to engage in effortful processing (Alter, Oppenheimer, Epley, & Eyre, 2007). According to dual-process theories, there are two distinct cognitive systems underlying thinking and reasoning, namely System 1 and System 2 (Kahneman, 2011). Disfluency theory suggests that fluency initiates quick intuitive process (i.e. System 1), whereas disfluency initiates deliberate analytical processes (i.e. System 2) (Alter et al., 2007). Whether a narrative is processed fast or slow, may influence narrative engagement.

There is a fundamental lack of empirical research on non-conventional media coupling and its effect on the narrative experience. The vast majority of articles on digital literature and related concepts are theoretical in nature (Hayles, 2008; Rettberg, 2018). Generally, the focus is on reviewing and categorizing existing works of digital literature, instead of identifying psychological mechanisms at play. The current study takes an empirical approach to understand the effects of non-conventional interactions, suggesting a relationship between processing fluency and narrative engagement.

Societally, it is relevant to learn more about the effect of non-conventional media coupling on narrative engagement. Designers could exploit characteristics specific to digital media more accurately if they are theoretically substantiated. Engaging narratives facilitate persuasion, whereby one develops story-consisted attitudes and beliefs (Green & Brock, 2000). Designers often aim to persuade their audience, triggering behavioral change (Walter, Bilandzic, Schwarz, & Brooks, 2020). Therefore, engaging narratives may aid designers in getting their message across. Moreover, traditional media often lose out to new media due to their attention-grabbing properties. Thus, exploiting new media characteristics may finally spark the younger generation growing up in the digital era to create an interest in literature.

The purpose of this study is to examine whether non-conventional media coupling enhances narrative engagement through arising manipulation figures. Therefore, the following research question is formulated: *To what extent do narrative-congruent non-conventional interactions in computer-based literary works influence narrative engagement, and to what extent is this relation mediated by perceived disfluency and manipulation figures interpretation?*

Theoretical Framework

Digital literature

Telling stories is a fundamental part of being human. Cave drawings, stemming from about 6000 years ago, are the earliest recorded indication of this need (Hurlburt & Voas, 2011). Thus, it is not surprising that literature arises where new forms of communication are developed (Pawlicka, 2014). With new media affecting essentially every sector of life, literary studies are affected as well (Simanowski, 2010). This is evident in the earliest piece of digital literature, programmed in 1952 by Christopher Strachey, only a year after the first ten commercially available computers were sold (Wardrip-Fruin, 2015). Strachey created a program generating love letters through randomly assigning words to basic sentences, such as "My—(adj.)—(noun)—(adv.)—(verb) your—(adj.)—(noun)." (Wardrip-Fruin, 2015). Using Turing's random number generator, this first work is exemplary in demonstrating the tension between the Digital and the Literary.

Bouchardon (2016) defines digital literature as "all the creations that are based on a tension between literariness and digital media specificities" (p. 12). This tension-based definition was suggested to reveal the dynamic property of the field, where digital literature adapts alongside constantly changing digital media (Bouchardon, 2016). Digital literature is intertwined with terms such as electronic literature (Hayles, 2008) and cyber literature (Koskimaa, 2007), all referring to roughly the same body of work (Rettberg, 2018). Simanowski (2011) prefers the term digital literature because it avoids misconceptions, since the term electronic can refer to electronic media such as cinema, radio, or television. Furthermore, a distinction can be made between digital literature and digitized literature, where the latter refers to adaptations of existing, initially printed works (Bouchardon, 2018b). Again, the boundaries between these two forms are rather blurred due to their strong digital components, lacking a universally adopted terminology (Bouchardon, 2018b). In this study, both digital literature and digitized literature are referred to when talking about digital literature.

The various characteristics of digital media allow for a great variety in literary works. Dresscher, 't Hooft, and O'Hare (2017) analyzed 30 recent digital literary works, assigning keywords based on story strategy and medium. The Love Letter Generator (1952) for instance, concerns the story strategy "generative" because it relies on an algorithm. Other story strategies include (non-)linear, game, and writing. Another example, Storium (2016), is a multiplayer game where interactors take turns in writing a scene within a preconceived scenario. Different types of media include apps, websites, and virtual/augmented reality, but also social media, physical books with digital elements, and installations (Dresscher et al., 2017). For instance, Out of Sight (2016) is a virtual reality (VR) installation, where two users experience the story simultaneously. The installation invites visitors to take a seat at the table opposite each other. Through VR headsets, one user takes the perspective of the nine-year-old Lena, while the other takes on the role of her father.

Please note that the above-mentioned story strategies and media are not exhaustive, as there is no universal classification system. Concerning these keywords, one could question the need for a comprehensive list. Due to the dynamic property of the field, digital literature is ever evolving (Skains, 2010). That is, whenever a new medium arises, literary works may utilize its characteristics. Hence, present views on what digital literature encompasses today, do not restrict its future forms. A variety of contemporary digital literary works can be found in a well-known collection held by the Electronic Literature Organization (ELO), called the Electronic Literature Collection. Another outstanding source for reading digital literature is Editions at Play. This initiative by Visual Editions and Google's Creative Lab publishes free books, exploring the internet's dynamic properties.

Concerning the tension-based definition of digital literature, Bouchardon (2016) distinguishes several tensions. One of the tensions is between semiotic properties of the Digital and the semiotic forms (i.e. linguistic text, image, sound, video). Due to its multimodality, meaning cannot only be found in the Literary, but in the technical potentialities as well (Skains, 2019). Saemmer (2009) calls this the *aesthetics of re-enchantment*, where technology opens the door to meanings conveyed through sounds and gestures to advocate something words could not tell, yet one could “feel” through experiencing the digital literary work. Here, a gesture is considered as a single action (e.g. pressing a key, clicking a button) (Bouchardon, 2014). Apparent in this tension, is the interplay between the Digital and the Literary.

On a theoretical level, the Digital is a technical device, relying on sequences of zeros and ones, offering a range of technical possibilities (Bouchardon & Heckman, 2012). According to Bachimont (2007), there is a distinction between recording form (i.e. source code) and restitution form (i.e. displayed text) (Bouchardon & Heckman, 2012). In a printed book, both forms are identical, whereas in digital media they are distinct. Bouchardon (2011) describes the Digital on three levels: a theoretical level, an applicative level, and an interpretative level. The last two levels together seem to be equal to restitution form, where applicative is the formatting of the theoretical level, and the interpretative level depends on the content and its interpretation.

The Digital’s counterpart, the Literary, is described as “an estrangement of the instrumental operations of language” (Zuern, 2015, p. 76). Simanowski (2010) suggests that there is a new quality of literariness triggered by the Digital. The idea here, is that the Literary must exceed the existing realm of letters to be categorized as digital literature (Simanowski, 2011). Through unexpected combinations, the Literary departures from naturalized protocols of linguistic usage to fulfill its proper literary function (Zuern, 2015). Saemmer (2009) even talks about overexploiting the Digital to reach a “technological sublime” in which the machine itself would provide novelty.

There are several properties specific to the Digital that could provide this new literariness, one of which is the Digital’s specific gesturality. That is, the text itself can be manipulated instead of only the physical medium (Bouchardon, 2018b). Formulated differently, the Digital provides a range of interaction possibilities on the text, whereas non-digital interactions are limited to the physical medium. For instance, in paper books, the reader advances through the narrative by turning the page, whereas in digital literary works, the interactor may click a hyperlink or reveal a textual element through hovering over the interactive area. Skains (2019) argues that the multimodality of the Digital results in a layered multiplicity of meanings, where each semiotic form contributes to the narrative. Moreover, Zuern (2015) notes that the appearance and meaning of digital literature is formed not only through linguistic utterances, but also through its computation.

Recently, Bouchardon (2018a) published an article coining ten gaps for digital literature. One of these gaps builds on the idea of a new literariness in digital literature. Another gap focuses on what this literary experience is based on, suggesting that most digital literary works require some use of gestures. The Digital thus affords possibilities for interactive digital creations, constituting to the literary experience. The current research aims to contribute to bridging the gap "from reading texts to interpretation through gestures" (Bouchardon, 2018a).

Manipulation figures

According to Saemmer (2009), a major constituent of digital literature is the Figure, which is defined as a gap between expectation and realized state (Genette, 1966). Figures are not exclusive to the Digital, stemming from the Latin word *figura* (Bullinger, 1898). Genette (1966) suggested that figures provide an opportunity for literature to stand out by defying readers' assumptions with its divergent meaning (Saemmer, 2012). A well-known application in traditional literature is the figure of speech, where a word or phrase has a separate figurative meaning from its literal definition (Saemmer, 2009). In digital literature, the condition of "digital birth" allows for implementing digital characteristics, such as interactivity (Simanowski, 2010). In turn, these features give rise to the figurative deployment of language opposed to the literal deployment (Zuern, 2015). The Digital thus makes it possible to have not only figurative language, but figurative interactions which contribute to the story.

Saemmer (2012) differentiates between two types of figures, namely: animation figures and manipulation figures. An animation figure arises from a (de-)coherent coupling between text and movement (Saemmer, 2012). For instance, when the size of the word *passages* gradually increases, it could be interpreted as passing through the passage. Hence, through animation, the word *passages* accompanies its linguistic meaning with its movement. Manipulation on the other hand, refers to the relationship between gestures and media content before and after this gesture is applied (Saemmer, 2015). If this relation is considered unexpected or even incongruous, the interactor may interpret this gap through a manipulation figure (Saemmer, 2012).

In both animation and manipulation figures, the interactor's expectations are destabilized (Saemmer, 2015). The distinction between the two types, is that the first is based on text animation whereas the latter arises from gestural manipulations. However, this distinction appears to be rather vague. In the instance of the growing word *passages*, it is only upon each mouse click that the word increases in size (Saemmer, 2012). In turn, pressing the word *passages* could be interpreted as walking through a passage, where each click represents a step. Saemmer (2012) argued that the progressive growth of *passages* reinforces that impression, thus confirming a relation between animation and manipulation figures. The current research focuses on manipulation figures, exploiting the Digital's specific gesturality.

One technique to design for manipulation figures is through implementing non-conventional media coupling (Bouchardon, 2014). Together with Saemmer and Bootz, Bouchardon (2014) proposed a model for analyzing manipulation gestures. The model distinguishes five levels in the articulation of signs. The lowest level of articulation is *the gesteme*, which corresponds to a distinct semiotic unit (e.g. pressing a button). The second level, *the acteme*, is the Digital response to the gesteme. At the third level, the combination of a gesteme and acteme form a Semiotic Unit of Manipulation (SUM). For instance, in the example of Loss of Grasp (2010), hovering with the mouse (i.e. the gesteme) at a certain point results in a disappearing cursor (i.e. the acteme). This SUM resembles the sensation of losing grasp on the situation.

The fourth level of articulation of signs is the media coupling, which is the pairing of the SUM with the media context. The idea here, is that the features of the gesture are only realized through its coupling with the content. Bouchardon (2014) distinguishes two types of media coupling, namely conventional coupling and non-conventional coupling. Conventional coupling is when the SUM corresponds to the expectations of the interactor, whereas non-conventional media coupling generates a de-coherence between a gesture and the obtained result. For instance, when a link is clicked but not activated, it would be considered as non-conventional. Hence, non-conventional media coupling causes a gap between the SUM and the interactor's expectations, which the interactor may interpret through manipulation figures. The concept non-conventional media coupling coined by Bouchardon (2014) is interchangeable with what Saemmer (2012) calls a de-coherence between text, movement, and manipulation gestures. The highest level of the model is the interactive discourse; only when the whole telling of the story is taken into account, does the gesture become fully meaningful (Bouchardon, 2014).

In his model, Bouchardon (2014) implies that non-conventional media coupling is implemented in congruence with the textual content. There is no literature yet on designing unexpected combinations that do not adhere to the content. Therefore, we propose to study not only the effects of media coupling, but also of semantic coupling. In the current research, two types of semantic coupling are distinguished, namely narrative-congruent and narrative-incongruent coupling. We define narrative-congruent interactions as experiences in line with the textual content of the passage, whereas narrative-incongruent interactions are not in line with the textual content of the passage. Here, a passage is a section of the narrative that is displayed on the screen. For example, the SUM "scratch", repetitively moving back and forth to reveal the layer underneath, could be narrative-congruent when the main character is scratching a lottery ticket to reveal their prize. However, this SUM would be narrative-incongruent when the main character is quietly sleeping during the interaction.

It is important to note, that whether a SUM is congruent with the textual content or not, is a subjective experience. Since the SUM is an abstract representation, it could be broadly interpreted (Bouchardon, 2014). In the instance of "scratch", a different interpretation of the SUM could be scratching an itchy skin. Other interpretations of the repetitive movement may include stirring a pan, sawing a plank, or painting a wall.

Due to the multiplicity of interpretation, a design challenge arises concerning the incongruence of SUMs. A pilot study revealed that if the content encompasses any form of action, the SUM was interpreted in congruence with the content, even if the movement did not particularly match the content ($N = 6$). Therefore, we propose that a SUM is incongruous when there is no motion within the textual content. Since the SUM only takes on its full meaning when situated in the context of the media coupling (Bouchardon, 2014), we hypothesize the following:

H1: Narrative-congruent interactions support interpretation of manipulation figures more than narrative-incongruent interactions do.

According to Genette (1966), the sense of figuration depends completely on the awareness of the reader (Steele, 1984). Saemmer (2009) agrees with Genette, adding that the term manipulation figure only seems fit when the gesture and generated content are surprising. As discussed, figures arise when the interactor experiences a gap between their expectations and the obtained result (Bouchardon, 2014). Since conventional media coupling does not induce any gap, the interactor may not interpret the manipulation figuratively. Based on the discussed literature, we hypothesize the following:

H2: Non-conventional interactions stimulate interpretation of manipulation figures more than conventional interactions do.

In designing the current digital literary work, we stumbled upon the question: “How can a conventional interaction be considered as a SUM?”. As discussed, a manipulation is the combination of a gesture with the media content (Saemmer, 2015). If the gesture itself should be conventional, the media content may be altered. For instance, a different story could be chosen for the conventional conditions. However, that would cause too much variance for an empirical study measuring narrative engagement. Another approach would be to design animation figures that are directly linked to the gesture. In the current study, we applied the latter approach.

For instance, if a “next” button is animated in a floating motion, the interactor has to follow its movement in order to click it. This movement is congruent with the

SUM, because the interactor has to move in the opposite direction relative to the remainder of the story. Since the act of pressing a button leads to a next paragraph and the cursor itself moves as intended, the interaction may still be considered conventional. Thus, the interactor adjusts its own gesture to suit the animation figure, but there are no manipulation expectations violated.

The addition of animation figures contributes to the semantic coupling, and therefore influences the current empirical research. One could argue however, that the button, and therefore the potential animation figure, is intertwined with a potential manipulation figure. Moreover, the animation figure is not applied to the text itself, but to the button, which initially is not part of the narrative. It is only through animation that the interactor may link the button to the story. Since the text itself is not affected, the potential animation figures do not cause any additional disfluency effects in reading the narrative itself. Furthermore, in the current research, the button animation is applied to all four conditions.

Perceived disfluency

The hypotheses stated above are based on the notion of interactors having certain expectations when performing a gesture. Norman (1999) coined the term perceived affordances to denote learned action possibilities. Perceived affordances are based on the integration and stabilization of previous experiences (Klinkenberg, 2000; Saemmer, 2012). In literature, the context recreates a situation that has already been encountered, where a certain gesture generated a relevant result (Bouchardon, 2014). Accordingly, in digital literature, the user may expect to turn the page by a swiping gesture based on previous experiences with an e-book. Or, if there is a button on the bottom right of the page, the user may expect to turn the page by clicking on this button. Non-conventional media coupling introduces a kind of difficulty into the text, demanding from readers to exert their imaginations (Zuern, 2015). According to Simanowski (2010), the uncommon use of features undermines automatic perception. The subjective experience of ease with which information is processed, is called processing fluency (Alter & Oppenheimer, 2009). The idea here, is that every cognitive task can be classified along a continuum from effortless to highly effortful. In turn, the corresponding experience is described ranging from fluent to disfluent. Fluent experiences arise through various cognitive processes, resulting in many forms of processing fluency (Alter & Oppenheimer, 2009).

Dimensions of processing fluency include, but are not limited to, perceptual and conceptual processing (Alter & Oppenheimer, 2009). The current body of work focuses on perceptual and conceptual processing for their impact on language processing (Gao, Dera, Nijhof, & Willems, 2019). Perceptual fluency is the ease with which the target stimuli are perceived (Alter & Oppenheimer, 2009). A common manipulation is altering the font of a text, differentiating between a clear font and an *unclear font*. Another type of processing is conceptual fluency, concerning the ease of processing meaning (Alter & Oppenheimer, 2009). In poetry for instance, conceptual fluency could be classified based on grammaticality and ambiguity (Gao et al., 2019).

Originally, the fluency theory states that fluent stimuli are perceived more positively than disfluent stimuli (Reber, Schwarz, & Winkielman, 2004). On the other hand, the disfluency theory argues that fluency initiates quick intuitive process (i.e. System 1), whereas disfluency initiates effortful analytical processes (i.e. System 2) (Alter et al., 2007). Put differently, disfluency creates a "mental roadblock" which disrupts the ease of processing and intensifies the depth of processing (Gao et al., 2019). Pieger et al. (2018) even speak of a "desirable difficulty" when referring to disfluency in the learning process.

To illustrate how disfluency may benefit perception, we take the example of the Moses illusion. In the original experiment, participants were asked how many pairs of animals Moses brought on board of his arc (Erickson & Mattson, 1981; Gao et al., 2019). Here, a large number of participants failed to notice the erroneous reference of Moses, even though they knew it was Noah who built the arc. However, Song and Schwarz (2008) found that manipulating perceptual fluency, influenced the amount of participants who noticed the error (Gao et al., 2019). That is, disfluent processing weakened the illusion.

Furthermore, van Rompay, de Vries, and van Venrooij (2010) found that pictorial and textual elements with congruent symbolic meanings, increase processing fluency through facilitating information integration. Initially, symbolic meaning integration requires elaborate processing, which is typically linked to disfluency (i.e. System 2) (Alter et al., 2007). Therefore, both congruent and incongruent symbolic meaning integration are perceived disfluent. However, incongruent symbols require even more extensive processing in order to arrive at a satisfying evaluation of the stimulus and resolve the incongruence (van Rompay et al., 2010). Hence, congruent symbols are processed more fluently than incongruent symbols by facilitating information integration. Based on these findings, we hypothesize the following:

H3: Narrative-incongruent interactions cause the interactor to perceive more disfluency in reading the narrative than narrative-congruent interactions do.

As discussed, non-conventional media coupling destabilizes the interactor's expectations (Bouchardon, 2014). This destabilization could be considered as a "mental roadblock", disrupting the ease of processing. In turn, the interactor engages in effortful processing (i.e. System 2) (Gao et al., 2019). Since effortful processing is typically linked to disfluency (Alter et al., 2007), we hypothesize the following:

H4: Non-conventional interactions cause the interactor to perceive more disfluency in reading the narrative than conventional interactions do.

Narrative engagement

Where the Romans used the term *figura*, the Greek called these figures *schema* ($\sigma\chi\eta\mu\alpha$) (Bullinger, 1898). In psychology, a schema is a mental representation of generic knowledge (Brewer, 1999). For instance, a dog schema includes an animal with four paws and a tail. When reading a narrative, readers use their real world knowledge (i.e. schemas) to link expressions and draw inferences from the story (Bower & Morrow, 1990). The reader thus constructs a mental representation of the situation and actions being described, which is called a mental model (Johnson-Laird, 1985). Schemas are closely linked to but distinct from mental models in that mental models are mental representations of the situation and actions being described in the narrative, whereas schemas persist regardless of the story (Bower & Morrow, 1990; Busselle & Bilandzic, 2008).

Over the years, scholars have proposed an abundance of concepts to denote the narrative experience (Bilandzic & Busselle, 2017). Bilandzic and Busselle (2017) define the narrative experience as perceiving and interpreting the textual content and its form. The researchers differentiate between core narrative experiences that specifically intend to measure engagement with narratives, and partially overlapping constructs which can be applied to other experiences as well. Three well-tested core constructs are transportation (Green & Brock, 2000), narrative engagement (Busselle & Bilandzic, 2008), and story world absorption (Kuijpers, Hakemulder, Tan, & Doicaru, 2014).

The current research measures narrative engagement to denote the interactor's experience. Narrative engagement is defined as the extent to which a story is perceived in an "immediate, emotionally and cognitively intense fashion" (Bilandzic & Busselle, 2017, p. 11). Unlike other constructs, narrative engagement is founded upon the process of constructing mental models (Bilandzic et al., 2019). Moreover, narrative engagement is explicitly a multidimensional construct, opposed to the textual core constructs transportation and story world absorption (Bilandzic & Busselle, 2017). Since the current research does not manipulate the story itself, the multidimensional focus of the narrative engagement scale aligns with the focus of studying gestural manipulations.

The question remains: how do the contemporary terms figures and schema relate if their origins are intertwined? In the instance of the dog schema, it is only after acquiring this schema that one is able to draw a figure of a dog (Radford, 2005). Applied to literary figures, it is only through the schema that one may understand its figurative component. Likewise, in digital literature, manipulation figures can only be interpreted through applying schemas as well. For instance, the schema of being nervous includes breathing rapidly and trembling hands. A shaky mouse cursor can then only be interpreted figuratively through combining the schema of being nervous, with the mental model of the story. If the mental model does not include a nervous character, the SUM is unlikely to be interpreted as nervous.

As discussed, figures have a figurative meaning in addition to their literal definition (Saemmer, 2009). Since mental models are a mental representation of the situation and actions being described in the narrative (Bower & Morrow, 1990; Busselle & Bilandzic, 2008), one may hypothesize that an additional modality from which meaning can be constructed, leads to more elaborate mental models. In previous research, mental models are strongly linked to narrative engagement (Bilandzic et al., 2019). Therefore, the current research does not include any measures on their relation. Instead we assume that manipulation figures link directly to narrative engagement, which can be explained through mental models. In conclusion, we hypothesize the following:

H5: Interpretation of manipulation figures enhances narrative engagement through applying and strengthening mental models.

Recent research suggests that experienced disfluency negatively affects narrative engagement (Walter et al., 2020). In their experiment, text was visually distorted and presented in a blurred and overexposed font. Through this manipulation of perceptual fluency, Walter et al. (2020) had no intention of adding disfluency to contribute to the narrative. The current research however, presumes disfluency emerging from SUMs, aiming to add narrative-congruent meaning. In this regard, it is not only perceptual fluency, but also conceptual fluency contributing to the overall perceived disfluency. Hence, the effect of perceived disfluency on narrative engagement emerging from semantic coupling, may be different from the effect emerging from media coupling.

Moreover, fluently processing a narrative has been found to lead to successful construction of mental models (Busselle & Bilandzic, 2008). At the same time, research suggests that disfluency enhances deeper processing and generalization from concrete examples (Alter, 2013). In turn, these processes are predicted to positively influence narrative engagement (Walter et al., 2020). Perhaps, the different findings could be explained by the different types of processing fluency at play. Taking into account these different types of disfluency, we hypothesize the following:

H6: For narrative-congruent interactions, perceived disfluency emerging from non-conventional interactions leads to higher narrative engagement than perceived disfluency emerging from conventional interactions does, whereas for narrative-incongruent interactions, perceived disfluency emerging from non-conventional interactions leads to lower narrative engagement than perceived disfluency emerging from conventional interactions does.

Overall, we hypothesize that narrative-congruent non-conventional interactions lead to higher narrative engagement than narrative-incongruent and conventional interactions do. A conceptual model including all hypotheses is shown in Figure 1. To answer the research question, the following sub-questions are introduced. In addition, the remaining hypotheses are stated:

Q1: To what extent does semantic coupling influence narrative engagement, and to what extent is this relation mediated by manipulation figures interpretation and perceived disfluency?

H7: Narrative-congruent interactions lead to higher narrative engagement than narrative-incongruent interactions do.

Q2: To what extent does media coupling influence narrative engagement, and to what extent is this relation mediated by manipulation figures interpretation and perceived disfluency?

H8: Non-conventional interactions lead to higher narrative engagement than conventional interactions do.

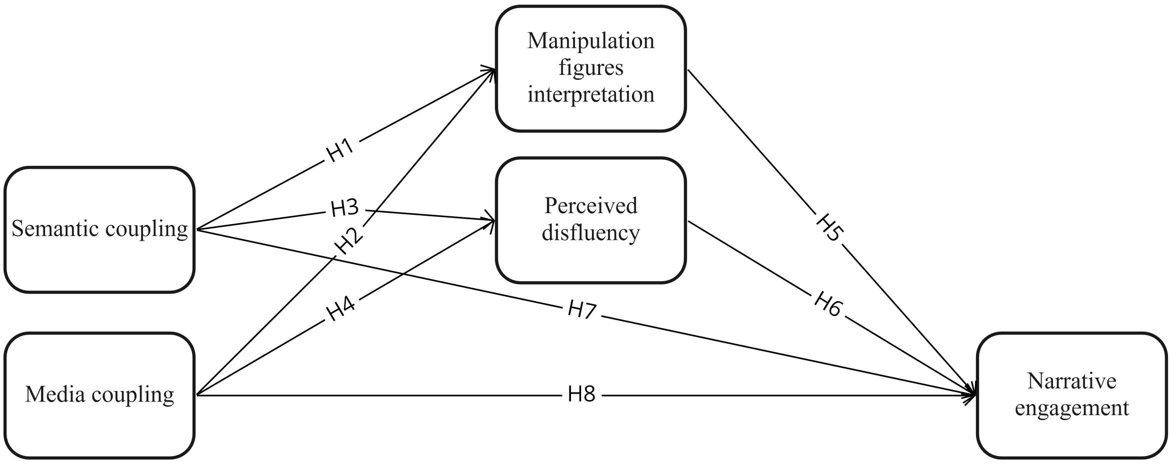


Figure 1. Conceptual model on the effects of semantic coupling and media coupling on narrative engagement, mediated by interpretation of manipulation figures and perceived disfluency

Method

Design

A 2x2 between-subjects design was applied to test the hypotheses. The type of interaction was distinguished along two dimensions: *semantic coupling* and *media coupling*. The independent variable *semantic coupling* included the levels narrative-congruent and narrative-incongruent. Narrative-congruent interactions are experiences in line with the textual content of the passage, whereas narrative-incongruent interactions are not in line with the textual content of the passage. The independent variable *media coupling* included the levels conventional and non-conventional. Conventional interactions are in line with the interactor's expectations, whereas non-conventional interactions are not in line with the interactor's expectations. The dependent variable was *narrative engagement*, and the mediating variables were *manipulation figures interpretation* and *perceived disfluency*.

Participants

The current research was conducted in the Netherlands. Since the study included reading a literary work, it was executed in the native language (i.e. Dutch). The total sample consisted of 152 participants, of which 21 cases were deleted during data preparation. Five of these cases were deleted because there were multiple recordings of the same participant. In two cases, the participant made a second attempt which lasted only one minute. Most likely, they forgot to copy the link to receive credits before closing the survey. In the other three cases, the survey was filled in twice simultaneously. How this might have happened is an enigma, and we have no way of knowing what condition they would have been subjected to. Since this is an integral part of the current study, we decided to delete these cases. The other 16 cases were excluded due to non-active participation. That is, if either both knowledge questions were answered incorrectly, or if the participant had indicated that they did not read the entire narrative on top of incorrectly answering one of the knowledge questions.

This resulted in a final sample of 131 participants (42 male, 88 female and 1 other, Mean age = 29.88, SD age = 12.31, age range = 18 - 76 years). Table 1 provides an overview of the distribution of age and gender per condition. Participants were recruited via convenience sampling in the researcher's private network, in literary groups on social media, and through the survey distribution platforms SurveySwap and SurveyCircle. The invitation was restricted to people aged 18 years or older, without dyslexia and with Dutch as their native language. Participation was voluntary; participants were not compensated with financial means.

Table 1

An overview of age and gender distribution among participants per condition, where age is expressed in M(SD)

	Age	Male	Female	Other
1. Narrative-congruent conventional (*N*=33)	32.21 (15.16)	8	25	0
2. Narrative-congruent non-conventional (*N*=34)	30.21 (12.02)	11	23	0
3. Narrative-incongruent conventional (*N*=32)	30.31 (11.93)	9	22	1
4. Narrative-incongruent non-conventional (*N*=32)	26.69 (9.26)	14	18	0

The sample size was determined by performing a power analysis in G*power (Faul, Erdfelder, Lang, & Buchner, 2007). In accordance with the 2x2 design, an a priori F-test calculation was carried out (for the statistical test ANCOVA). Cohen's f was set to .25, which is a medium effect size (Cohen, 1988). Power was set at .80, which means that if there is an effect in reality, 20% of the time this experiment is run we would fail to obtain a statistically significant effect (i.e. Type II error) (UCLA: Statistical Consulting Group, n.d.). The alpha was set to .05, and number of groups to 4. In psychological research, a power of .80 and an alpha of .05 are common. The F-test calculation in G*power resulted in a total sample size of 128 participants (i.e. 32 per group). This number roughly corresponds to Tilburg University's standards of having 30 participants per condition.

Materials

Digital literary work. Specifically for this study, we transformed an existing piece of literature into a digital literary work to be able to manipulate semantic coupling and media coupling. For the narrative, we took the first passage of the short story "De vis in de fles" by Olde Heuvelt (2012). Translated into English, the story has been published as "The day the world turned upside down" (Olde Heuvelt, 2014). We deliberately chose to digitize an original story to ensure high literary quality. With "De vis in de fles", Olde Heuvelt has won the Paul Harland award 2012, where he was praised for his talent of telling stories that rarely do what the reader expects (Olde Heuvelt, 2012). We chose to work with this story for its vivid imagery, allowing for semantically meaningful interactions. The digital literary work was designed in Twine, which is an open-source tool for telling interactive stories, supporting JavaScript, HTML5, and CSS(Chris Klimas, n.d.). The current work was developed in the default story format Harlowe version 3.2.1 within Twine version 2.3.13.

Manipulations. Four versions of the digital literary work were created, differentiating between semantic coupling and media coupling of the interactions. An overview of the four conditions including hyperlinks to the digital literary works, are included in Table 2. The conditions each included four Semiotic Units of Manipulation (SUMs), which we called "upside down", "gravity", "not together", and "nervous". Each SUM corresponds to a specific passage, where the main character uses these words to describe his situation. In the two narrative-congruent conditions, these SUMs were applied to the corresponding passage. In the two narrative in-congruent conditions, these SUMs occurred at a different point in the story. Namely, during a passage where the content did not include motion to prevent a meaningful interpretation of the SUM.

In all four conditions, the interactor advanced through the story by clicking the "next" button displayed below the passage, prompting a new passage to replace the

Table 2

Hyperlinks to the four conditions in the 2x2 between-subjects design, including external links written out for print

	Semantic coupling	Media coupling	https://melissapruijn.github.io
Condition 1	Narrative-congruent	Conventional	/diedag
Condition 2	Narrative-congruent	Non-conventional	/diedagstond
Condition 3	Narrative-incongruent	Conventional	/diedagstonddewereld
Condition 4	Narrative-incongruent	Non-conventional	/diedagstonddewereldopznkop

previous one. For each SUM, the “next” button was animated. For instance, the SUM “upside down”, displayed the button above the text. The placement of the button affected the gesture, causing the interactor to move to the top of the screen. All narrative-congruent SUMs can be categorized as “signs motivated by similarity”, where the animation is in line with the textual content of the passage (Klinkenberg, 2000; Saemmer, 2012). In addition, for the two non-conventional conditions, the cursor movement was altered. For instance, the SUM “upside down” caused the y-axis to be inverted. An overview of all four SUMs and their implementations is included in Table 3. A visual snippet of the digital literary work is shown in Figure 2.

According to Bouchardon (2014) and Saemmer (2015), the functioning of non-conventional media coupling depends on the repetition. Only by repeating the gesture does the interactor gradually establish its meaning and understand that it is not a bug (Bouchardon, 2014). Therefore, all SUMs manipulate the cursor, repeating manipulation on the same object. A pilot study validated the suitability of the manipulations for each condition ($N = 6$).

Measures

The study was set up in the online survey platform Qualtrics (Qualtrics, n.d.). The study consisted mainly of two parts: reading a digital literary work, and filling in a questionnaire. The independent variables were manipulated in the literary work, and

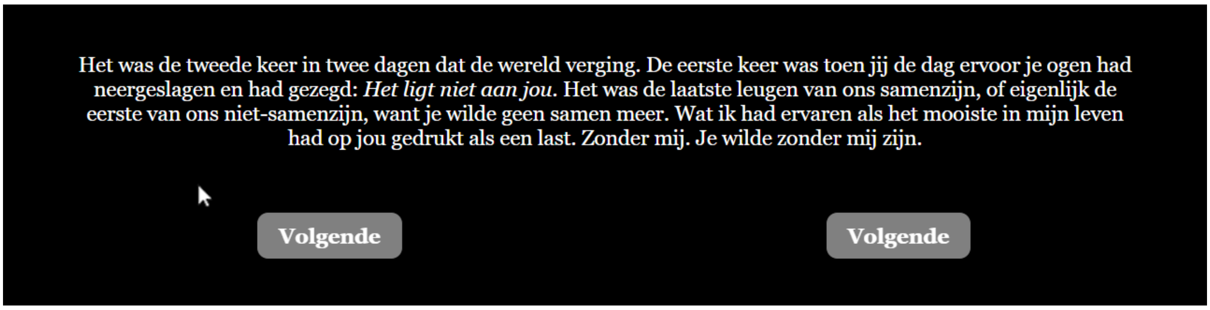
Table 3

An overview of the Semiotic Units of Manipulation (SUM), including their implementations for the conventional and non-conventional conditions

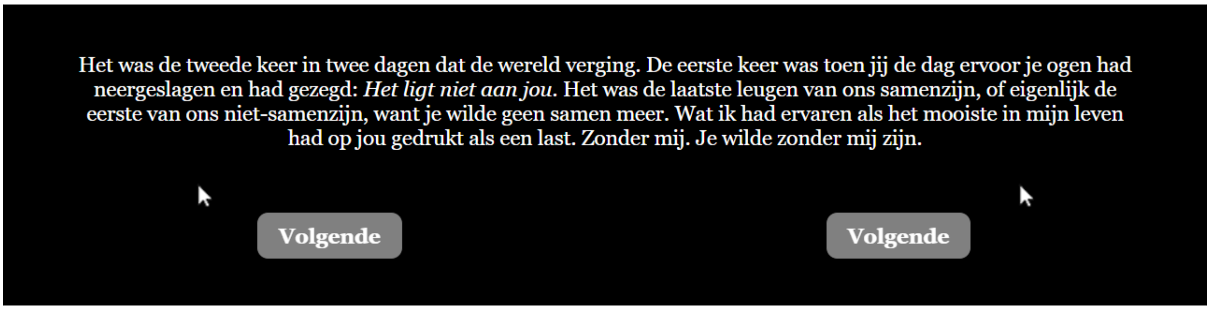
SUM	Conventional	Non-conventional
Upside down	Button above passage	Button + Cursor movement inverted y-axis
Gravity	Button floating	Button + cursor floating
Not together	Button duplicated	Button + cursor duplicated
Nervous	Button shaking	Button + cursor shaking

the mediating and dependent variables were measured with the questionnaire. First, *narrative engagement* was measured with a Likert scale ($\alpha = .56$) proposed by Busselle and Bilandzic (2009), where each dimension consists of three items, resulting in a total of twelve items. In the current section, all mentioned values of Cronbach's alpha refer to results from the current study. A translated version of the narrative engagement scale was obtained from van den Ham (2020).

Thereafter, *perceived disfluency* in reading the narrative was measured using a



(a)



(b)

(c)

(d)

Figure 2. The Semiotic Unit of Manipulation “not together” in all four conditions. (a) Condition 1: narrative-congruent conventional, where the SUM is in line with the context, and the interaction is in line with the interactor’s expectations. (b) Condition 2: narrative-congruent non-conventional, where the SUM is in line with the context, but the interaction is not in line with the interactor’s expectations. (c) Condition 3: narrative-incongruent conventional, where the SUM is not in line with the context, but interaction is in line with the interactor’s expectations. (d) Condition 4: narrative-incongruent non-conventional, where the SUM is not in line with the context, and interaction is not in line with the interactor’s expectations

5-item semantic differential scale (α = .88) of the fluency experience (Graf, Mayer, & Landwehr, 2018). The authors argued that this scale can be applied to different types of processing fluency. Neither the narrative engagement scale nor the fluency scale was specified with a preferred number of points. Technically, a Likert scale consists of 5-points, ranging from strongly agree to strongly disagree (Likert, 1932; Revilla, Saris, & Krosnick, 2014). Since *narrative engagement* was originally measured with a Likert scale, we chose to implement a 5-point scale for both *narrative engagement* and *perceived disfluency*. The original scales are included in Appendix A.

Subsequently, *manipulation figures interpretation* was measured with six 5-point Likert scale items ($\alpha = .82$), assessing the extent to which participants interpreted any irregularities in line with the context. Since there is a lack of research on figure interpretation, there does not yet exist a verified scale to measure this. The current scale consists of three items on manipulations specifically ($\alpha = .82$), and three items on animation figures ($\alpha = .73$). Even though the current research focuses on manipulation figures, from the interactor's perspective it is not of importance which design manipulation leads to a certain figure. Therefore, we should be able to account for any effects stemming from animation figures as well. The proposed scale was validated in the pilot study ($N = 6$). Moreover, this scale was deliberately placed after the narrative engagement and fluency scales, to ensure that it would not influence the previous measures.

Furthermore, the conditions were validated by asking binary questions on whether the interactions were perceived as conventional, and whether these were congruent with the context. Moreover, active participation was tested for with knowledge questions such as "What is the fish called?". Thereafter, participants were asked whether they already knew this story and if so, what the writer is called. This information was needed to account for potential differences in prior knowledge about the narrative, possibly influencing the digital experience. Moreover, we asked whether participants would be interested in continuing reading the story, which was analyzed for exploratory purposes. Prior to the experiment, demographic questions about age, gender, and level of education were asked to get a general overview of the sample. The complete Dutch questionnaire is included in Appendix B.

Procedure

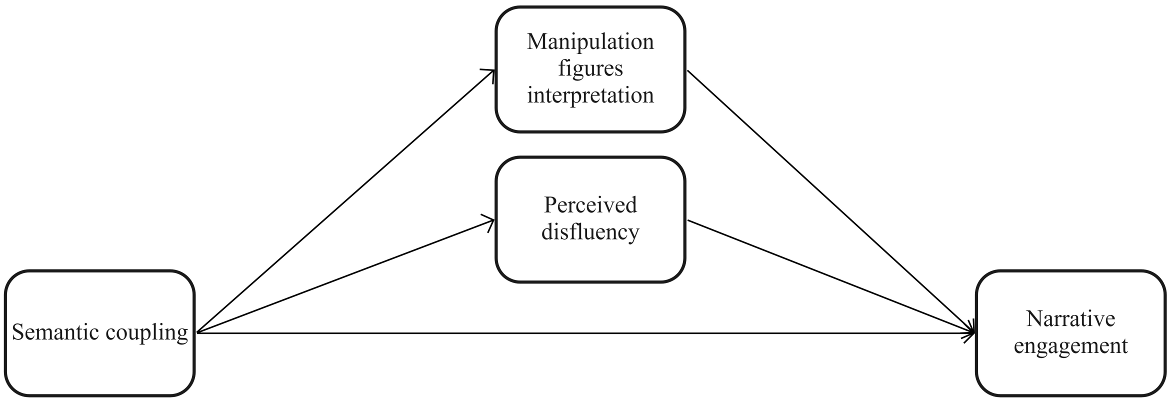
Within the online survey platform Qualtrics, participants read an informed consent form and gave their consent. Moreover, they were asked to confirm they met the applicable criteria (i.e. no dyslexia, native Dutch), as well as confirm they were situated behind a computer. Subsequently, participants were randomly assigned to one of four conditions. After completing one of four versions of the digital story, all participants were asked to fill in the same questionnaire. Afterwards, participants were thanked for their participation and debriefed.

Data analysis

Data preparation. After publishing the survey, we found out that some respondents were sent back to the beginning of the survey after reading the digital literary work, instead of continuing the questionnaire from where they left off. As a result of restarting the survey, they were randomly allocated to one of the four conditions once more. Most likely, the participant did not read the narrative again, in the understanding that they had just read it. Hence, their recorded responses did not match the condition documented in the data. Through comparing IP addresses and start/end time, we manually recoded these cases ($N = 6$). However, there were also two cases where the participant would have read the narrative in under one minute. Another explanation would be that they accidentally pressed the next button without reading the narrative first. Since there was no option to go back, these participants probably restarted the survey in another web browser. Hence, we did not recode these two cases.

Statistical analysis. Two parallel mediation analyses were performed in the statistical software SPSS (version 27) (IBM Corp., n.d.), using the PROCESS Macro (Hayes, n.d.). For the first sub-question, formulated "To what extent does semantic coupling influence narrative engagement, and to what extent is this relation mediated by manipulation figures interpretation and perceived disfluency?", a parallel mediation analysis tested the effect of semantic coupling on narrative engagement, with manipulation figures interpretation and perceived disfluency as mediators. For the second sub-question, formulated "To what extent does media coupling influence narrative engagement, and to what extent is this relation mediated by manipulation figures interpretation and perceived disfluency?", a parallel mediation analysis tested the effect of media coupling on narrative engagement, with manipulation figures interpretation and perceived disfluency as mediators. Figure 3 depicts conceptual models for both sub-questions, which together tested all hypotheses except for H6.

The sixth hypothesis, formulated “For narrative-congruent interactions, perceived disfluency emerging from non-conventional interactions leads to higher narrative engagement than perceived disfluency emerging from conventional interactions does, whereas for narrative-incongruent interactions, perceived disfluency emerging from non-conventional interactions leads to lower narrative engagement than perceived disfluency emerging from conventional interactions does.”, was tested with four separate Pearson correlations.



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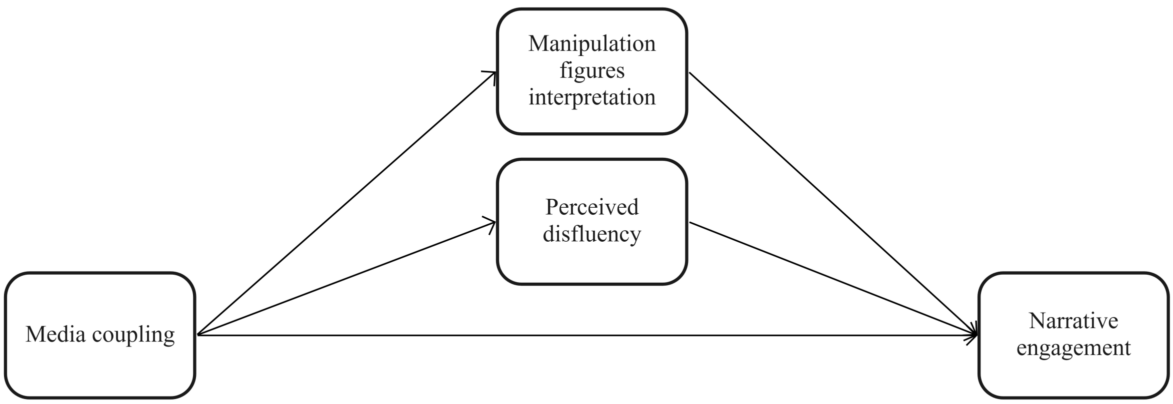

(b)

Figure 3. Conceptual models on the effects of (a) semantic coupling and (b) media coupling on narrative engagement, mediated by interpretation of manipulation figures and perceived disfluency

Results

General descriptive statistics of the results are provided in Table 4. Access to the data and analysis script may be requested via Tilburg University.

Table 4

An overview of the means and standard deviations of the mediating and dependent variables per condition expressed in M(SD), as well as the percentages of participants who perceived the narrative as semantically congruent, conventional, and who were interested in continuing reading

	Manipulation figures	Disfluency	Narrative engagement
1. Narrative-congruent conventional ($N = 33$)	2.28 (1.09)	3.33 (0.82)	2.94 (0.59)
2. Narrative-congruent non-conventional ($N = 34$)	3.42 (1.18)	3.52 (0.98)	3.00 (0.44)
3. Narrative-incongruent conventional ($N = 32$)	2.29 (0.96)	3.13 (0.76)	2.94 (0.45)
4. Narrative-incongruent non-conventional ($N = 32$)	3.01 (1.06)	3.53 (1.04)	3.02 (0.44)
	Perceived semantic congruency	**Perceived media conventionality**	**Interested**
1. Narrative-congruent conventional ($N = 33$)	42.4%	51.5%	33.3%
2. Narrative-congruent non-conventional ($N = 34$)	61.8%	8.8%	47.1%
3. Narrative-incongruent conventional ($N = 32$)	34.4%	78.1%	34.4%
4. Narrative-incongruent non-conventional ($N = 32$)	37.5%	18.8%	53.1%

Preliminary checks

First, a manipulation check was carried out to check whether the participants perceived the manipulations as intended, using a chi-square test. There was no significant association between manipulated semantic coupling and perceived semantic coupling (χ^2 (1) = 3.53, p = .060). Based on the odds ratio, the odds of perceiving the digital literary work as narrative congruent was 1.95 times higher if respondents were allocated to a condition that was manipulated to be narrative congruent. However, there was a significant association between manipulated media coupling and perceived media coupling (χ^2 (1) = 35.80, $p < .001$). The odds of perceiving the digital literary work as conventional was 11.57 times higher if respondents were allocated to a condition that was manipulated to be conventional. The percentual distributions of how the coupling was perceived compared to how it was manipulated can be found in Table 5.

Table 5

Results of the chi-square manipulation check, expressed in percentages

		Manipulated semantic coupling	
		Congruent	Incongruent
Perceived semantic coupling	Congruent	60.3%	39.7%
	Incongruent	43.8%	56.2%
		Manipulated media coupling	
		Conventional	Non-conventional
Perceived media coupling	Conventional	82.4%	17.6%
	Non-Conventional	28.7%	71.3%

For the 6-item figures scale, a confirmatory factor analysis suggested two components as expected. The Kaiser-Meyer-Olkin measure of sampling adequacy was .66, which is just above the commonly recommended value of .60 (Field, 2013). Initial eigen values indicated that the first two factors explained 54% and 19% of the variance respectively. According to the rotated component matrix, the first two items had a primary factor loading of .89 or above, the second two items had a cross-loading of .49 or above, and the last two items had a primary factor loading of .60 or above for the other component. Since all items had a loading of .50 or above for at least one component, there was no need to eliminate an item. We decided to assign the third item to the first component, and the fourth item to the second component, to suit the scale's initial design. That is, the first three items measured interpretation of manipulation figures ($\alpha = .82$), and the last three items measured interpretation of animation figures ($\alpha = .73$). Together, the six items measured figures in general ($\alpha = .82$).

Furthermore, we checked the assumptions for the main statistical tests. An outlier analysis testing for Mahalanobis Distance, Cook's Distance, and leverage values, confirmed there were no outliers. That is, each case was not marked as an outlier for at least two out of the three detection methods. Tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern (semantic coupling, Tolerance = .99, VIF = 1.01; media coupling, Tolerance = .81, VIF = 1.24; manipulation figures, Tolerance = .82, VIF = 1.22; perceived disfluency, Tolerance = .96, VIF = 1.04). That is, each tolerance value was above 0.20, and each VIF value was below 10. With a Durbin-Watson value of 1.49, which falls within the margins of 1 and 3, the data met the assumption of independent errors (Field, 2013). Furthermore, the histogram of standardized residuals indicated that the data contained approximately normally distributed errors, as did the normal P-P plot of standardized residuals, which showed points that were not close to the diagonal. The scatterplot of standardized residuals showed that the data met the assumptions of homogeneity of variance and linearity. These three plots can be found in Figure 6, in Appendix C.

Out of the 131 participants, there were five people who indicated that they already knew about the story, of which two people were able to name the author. These five people were somewhat equally distributed among the groups, with two participants in the first condition, two participants in the third condition, and one in the fourth condition.

Main analyses

Sub-question 1: semantic coupling. The first sub-question on the effect of semantic coupling on narrative engagement, and to what extent this relation is mediated by manipulation figures interpretation and perceived disfluency, was measured with a parallel Hayes PROCESS mediation analysis (model 4). Bootstrapping was set at 5000 samples. Since the independent variable was binary and randomized between conditions, the indirect effects (i.e. *ab*) reported are partially standardized (Miočević, O'Rourke, MacKinnon, & Brown, 2018). That is, *ab* is expressed as the change in standard deviation of the dependent variable between the two conditions. All effects can be found in Figure 4.

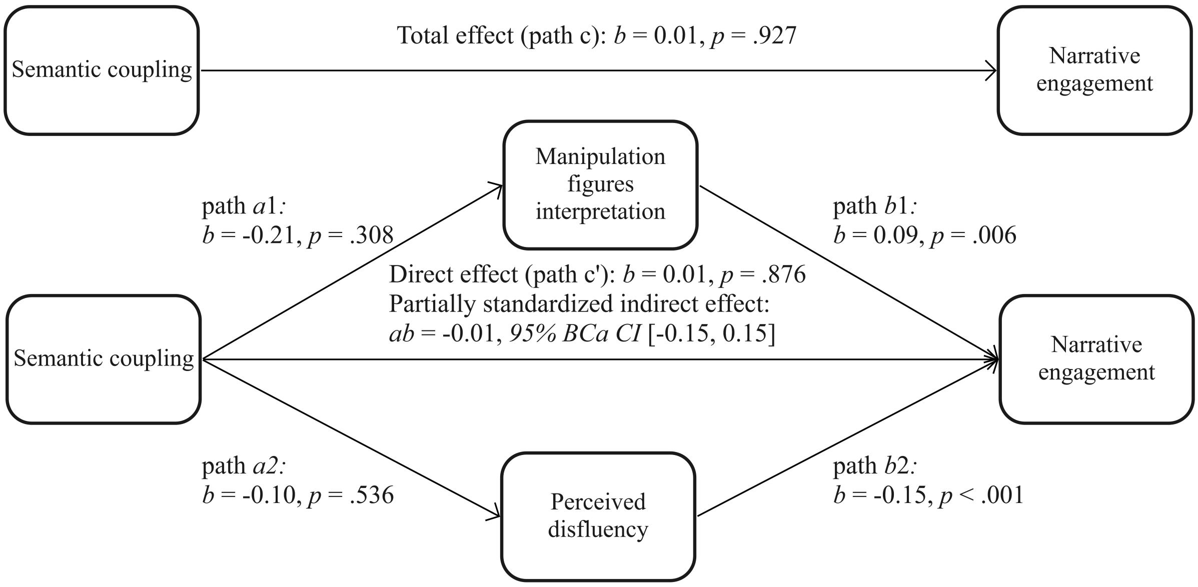

Figure 4. The effect of semantic coupling on narrative engagement, mediated by manipulation figures interpretation and perceived disfluency

According to the parallel mediation model (Figure 4), semantic coupling did not significantly influence interpretation of manipulation figures (b = -0.21, p = .308) and perceived disfluency (b = -0.10, p = .536). However, manipulation figures interpretation did significantly influence narrative engagement (b = 0.09, p = .006). That is, for every one point increase on the manipulation figures scale, there was an average increase of 0.09 points on the narrative engagement scale. Perceived disfluency significantly influenced narrative engagement as well (b = -0.15, $p < .001$). That is, narrative engagement decreased on average 0.15 points for every one point increase of perceived disfluency. There is no standard classification regarding the effect sizes since these are relative to the scales, but on a five-point scale these effects seem small.

There was no significant total effect for semantic coupling on narrative engagement through manipulation figures interpretation and perceived disfluency (b = 0.01, p = .927). This total effect is composed of the direct effect and the indirect effect. Unsurprisingly, the direct effect did not yield a significant result either (b = 0.01, p = .876). Moreover, there was no significant partially standardized indirect effect for semantic coupling on narrative engagement through manipulation figures interpretation and perceived disfluency (ab = -0.01, *95% BCa CI* [-0.15, 0.15]). That is, when taking both mediators into account simultaneously, there was no significant indirect effect of semantic coupling on narrative engagement. Furthermore, there was no significant partially standardized indirect effect for semantic coupling on narrative engagement through either manipulation figures interpretation (ab = -0.04, *95% BCa CI* [-0.14, 0.04]), or perceived disfluency (ab = 0.03, *95% BCa CI* [-0.07, 0.16]). That is, neither manipulation figures interpretation nor perceived disfluency mediated the relationship between semantic coupling and narrative engagement. Since these effects oppose one another, it is unsurprising that taking into account both mediators simultaneously did not yield a significant effect deviating from zero.

Sub-question 2: media coupling. The second sub-question on the effect of media coupling on narrative engagement, and to what extent this relation is mediated by manipulation figures interpretation and perceived disfluency, was measured with a parallel Hayes PROCESS mediation analysis as well (model 4). All effects can be found in Figure 5.

According to the parallel mediation model (Figure 5), media coupling significantly influenced interpretation of manipulation figures (b = 0.94, $p < .001$). That is, being in the non-conventional condition led to an average increase of 0.94 points on the manipulation figures scale, with respect to being in a conventional condition. On a

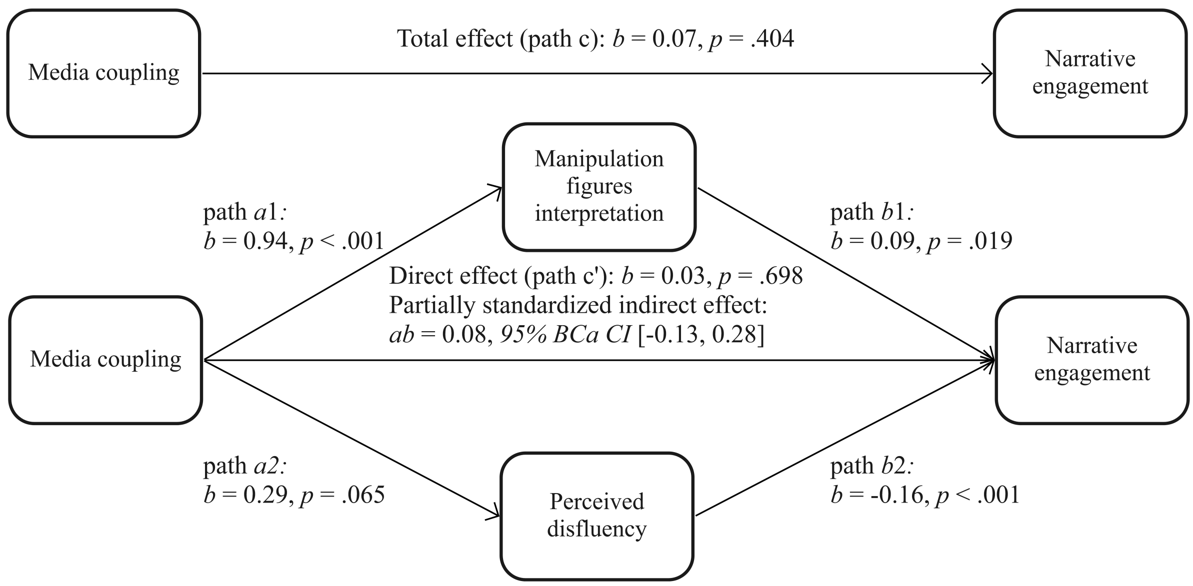

Figure 5. The effect of media coupling on narrative engagement, mediated by manipulation figures interpretation and perceived disfluency

five-point scale, this effect seems relatively large. However, media coupling did not significantly influence perceived disfluency (b = 0.29, p = .065). Moreover, manipulation figures interpretation did significantly influence narrative engagement (b = 0.09, p = .019). That is, for every one point increase on the manipulation figures scale, there was an average increase of 0.09 points on the narrative engagement scale. Perceived disfluency significantly influenced narrative engagement as well (b = -0.16, p < .001). This means that narrative engagement decreased on average 0.16 points for every one point increase of perceived disfluency. These mediating effects on narrative engagement are quite similar to the mediating effects stemming from semantic coupling. Again, these effects seem small.

There was no significant total effect for media coupling on narrative engagement through manipulation figures interpretation and perceived disfluency (b = 0.07, p = .404). The direct effect did not yield a significant result either (b = 0.03, p = .698). Moreover, there was no significant partially standardized indirect effect for media coupling on narrative engagement through manipulation figures interpretation and perceived disfluency (ab = 0.08, *95% BCa CI* [-0.13, 0.28]). In other words, the relationship between media coupling and narrative engagement was not mediated by both manipulation figures interpretation and perceived disfluency simultaneously. However, there was a significant partially standardized indirect effect for media coupling on narrative engagement through manipulation figures interpretation (ab = 0.17, *95% BCa CI* [0.03, 0.33]), but not through perceived disfluency (ab = -0.10, *95% BCa CI* [-0.22, 0.01]). Therefore, the results suggest that manipulation figures interpretation did mediate the relationship between media coupling and narrative engagement, but that perceived disfluency did not.

Hypothesis 6: disfluency. The sixth hypothesis, formulated "For narrative-congruent interactions, perceived disfluency emerging from non-conventional interactions leads to higher narrative engagement than perceived disfluency emerging from conventional interactions does, whereas for narrative-incongruent interactions, perceived disfluency emerging from non-conventional interactions leads to lower narrative engagement than perceived disfluency emerging from conventional interactions does.", was tested with four separate Pearson correlations. All effects can be found in Table 6. For the narrative-congruent conventional condition, there was a significant relation between perceived disfluency and narrative engagement (r = -.47, p = .006). This is a medium effect (Field, 2013), where higher perceived disfluency leads to a decrease in narrative engagement. The other three correlations did not yield a significant effect for the narrative-congruent non-conventional condition (r = -.23, p = .197), the narrative-incongruent conventional condition (r = -.33, p = .063), and the narrative-incongruent non-conventional condition (r = -.25, p = .169).

Exploratory analyses

Since there was no significant association between manipulated semantic coupling and perceived semantic coupling (χ^2 (1) = 3.53, p = .060), we performed the mediation analysis for SQ1 with perceived semantic coupling instead of manipulated semantic coupling. Here, manipulated semantic coupling is based on the assigned condition, which we designed to be narrative-congruent or incongruent, whereas perceived semantic coupling is derived from the survey question on whether the participant actually

Table 6

Correlation coefficients between perceived disfluency and narrative engagement, per condition

		Narrative engagement	
		Pearson's r	p-value
Perceived disfluency	1. Narrative-congruent conventional (N = 33)	-.47	.006
	2. Narrative-congruent non-conventional (N = 34)	-.23	.197
	3. Narrative-incongruent conventional (N = 32)	-.33	.063
	4. Narrative-incongruent non-conventional (N = 32)	-.25	.169

perceived the Semiotic Units of Manipulation (SUMs) as congruent or incongruent with the textual content of the passage. All effects can be found in Figure 7, in Appendix D. In contrast to the manipulated semantic coupling model, perceived semantic coupling did significantly influence manipulation figures interpretation (b = -0.75, p < .001), as well as perceived disfluency (b = -0.40, p = .011). That is, perceiving the SUMs as narrative-incongruent led to an average decrease of 0.75 points on the manipulation figures scale, as well as an average decrease of 0.40 points on the perceived disfluency scale. In turn, manipulation figures interpretation significantly influenced narrative engagement (b = 0.09, p = .017). Perceived disfluency significantly influenced narrative engagement as well (b = -0.16, p < .001). These effects on narrative engagement are comparable to the effects stemming from manipulated semantic coupling.

There was no significant total effect for perceived semantic coupling on narrative engagement through manipulation figures interpretation and perceived disfluency (b = 0.05, p = .541). The direct effect did not yield a significant result either (b = -0.05, p = .557). However, there was a significant partially standardized indirect effect for perceived semantic coupling on narrative engagement through manipulation figures interpretation (ab = -0.14, *95% BCa CI* [-0.30, -0.02]), as well as through perceived disfluency (ab = 0.13, *95% BCa CI* [0.03, 0.28]). Since these effects are opposite of each other, there was no significant indirect effect when taking both mediators into account simultaneously (ab = -0.003, *95% BCa CI* [-0.22, 0.20]). Taken separately, both manipulation figures interpretation and perceived disfluency mediated the relationship between perceived semantic coupling and narrative engagement.

Moreover, the mediation analyses were repeated with animation figures instead of manipulation figures. All effects can be found in Figures 8 and 9, in Appendix D. There are two substantial differences between the parallel mediation models including animation figures and the models including manipulation figures. First, semantic coupling significantly influenced interpretation of animation figures (b = -0.50, $p <$ .001). That is, being in an incongruent condition led to an average decrease of 0.50 points on the animation figures scale, with respect to being in a congruent condition. In the main analysis on sub-question 1, we did not find a significant effect of semantic coupling on manipulation figures interpretation. Secondly, media coupling did not significantly influence interpretation of animation figures (b = 0.18, p = .331), whereas in the main analysis on sub-question 2, we did find a significant effect of media coupling on manipulation figures interpretation. All other effects are comparable in significance and magnitude.

Furthermore, we performed a Pearson correlation test to detect whether there is an effect of age on perceived disfluency. There was no significant correlation between age and perceived disfluency (r = .12, p = .170). Moreover, a binary logistic regression was carried out to test the effect of narrative engagement on interest in continuing reading. Again, we found no significant effect (b = -0.19, p = .618). Lastly, a chi-square test analyzed the effect of assigned condition on interest in continuing reading, of which the percentages can be found in the previous Table 4. There was no significant relation between assigned condition and interest in continuing reading (χ^2 (3) = 3.77, p = .288).

Discussion and Conclusion

The current study examined the extent to which semantic coupling and media coupling in computer-based literary works influence narrative engagement, as well as the extent to which this relation is mediated by perceived disfluency and manipulation figures interpretation. A summary of the results is provided in Table 7.

Table 7

An overview of the hypotheses and their results

	Results
H1: The effect of semantic coupling on manipulation figures	b = -0.21, p = .308
H2: The effect of media coupling on manipulation figures	b = 0.94, $p < .001$
H3: The effect of semantic coupling on perceived disfluency	b = -0.10, p = .536
H4: The effect of media coupling on perceived disfluency	b = -0.29, p = .065
H5: The effect of manipulation figures on narrative engagement	
Stemming from semantic coupling	b = 0.09, p = .006
Stemming from media coupling	b = 0.09, p = .019
H6: The effect of perceived disfluency on narrative engagement	
Condition 1: Narrative-congruent conventional	r = -.47, p = .006
Condition 2: Narrative-congruent non-conventional	r = -.23, p = .197
Condition 3: Narrative-incongruent conventional	r = -.33, p = .063
Condition 4: Narrative-incongruent non-conventional	r = -.25, p = .169
H7: The effect of semantic coupling on narrative engagement	b = 0.01, p = .927
H8: The effect of media coupling on narrative engagement	b = 0.07, p = .404

Manipulation figures

In his article on manipulation figures, Bouchardon (2014) argued that the meaning of a Semiotic Unit of Manipulation (SUM) depends on the context in which it is placed. Subsequently, we designed narrative-incongruent SUMs, with the purpose of being uninterpretable within the content of the passage. In turn, the interactor was expected to be inhibited from prescribing meaning to these SUMs. Thus, we hypothesized that narrative-congruent interactions would support interpretation of manipulation figures more than narrative-incongruent interactions would (H1). The main results do not support this hypothesis when analyzing the data within the assigned conditions (i.e. manipulated semantic coupling).

In an exploratory analysis, we repeated the test based on whether the participant perceived the SUMs as narrative-congruent or -incongruent (i.e. perceived semantic coupling). Here, the results did support the hypothesis. That is, participants perceiving the SUMs as incongruent showed lower ratings of manipulation figures interpretation than participants perceiving the SUMs as congruent. These findings suggest that whether a semantic coupling is (in)congruent with the narrative, is a subjective experience. In another exploratory analysis, we found a significant effect of manipulated semantic coupling on animation figures interpretation. That is, participants in the incongruent conditions showed lower ratings of animation figures interpretation than participants in the congruent conditions. Perhaps in the narrative congruent conditions, the movements of the buttons were easier to interpret figuratively than the movements of the cursor. Since the main analysis did not support the hypothesis, our initial hypothesis is rejected. Nonetheless, exploration suggests that there is indeed a link between experiencing something as narrative (in)congruent and interpreting animation and manipulation figures. Future research should further investigate this relationship.

In the same article, Bouchardon (2014) suggested that manipulation figures only arise when the interaction is unexpected. When the interactor experiences a gap between their expectations and the obtained result, they may interpret the manipulation figuratively. Based on theory on perceived affordances (Norman, 1999), we designed a non-conventional version where the cursor movement was altered (e.g. inverted y-axis). This led to the hypothesis that non-conventional interactions would stimulate interpretation of manipulation figures more than conventional interactions would (H2). The results support this hypothesis, where participants in the non-conventional conditions scored on average 0.94 point higher on ratings of manipulation figures interpretation (a 5-point scale) than participants in the conventional conditions. Thus, we do not reject our second hypothesis.

Perceived disfluency

Previous research on symbolic meaning integration showed that incongruent symbols are processed more extensively than congruent symbols (van Rompay et al., 2010). The idea here, is that disfluent processing is needed to resolve the experienced incongruency. Thus, we hypothesized that narrative-incongruent interactions would cause the interactor to perceive more disfluency in reading the narrative than narrative-congruent interactions would (H3). The main results did not support this hypothesis. However, an exploratory analysis based on perceived semantic coupling did support the hypothesis. The results showed lower ratings of perceived disfluency for perceiving the SUMs as narrative-incongruent as opposed to narrative-congruent, where the disfluency scale ranged from difficult to easy. That is, scores on perceived disfluency indicated that participants perceiving the SUMs as incongruent perceived the narrative as more disfluent than participants perceiving the SUMs as congruent did. Hence, the direction of the exploratory result confirms our expectations. However, since the main analysis yielded a non-significant result, we reject the hypothesis. It is clear that there is a discrepancy between manipulating a SUM to be narrative-congruent or -incongruent, and actually perceiving it as narrative-congruent or -incongruent. The limitation section further discusses the subjectivity of semantic coupling and its design implications.

In defining non-conventional media coupling, Bouchardon (2014) described it as a destabilization of the interaction's expectations, which could be translated to a "mental roadblock" that in turn disrupts processing ease (Gao et al., 2019). Therefore, we hypothesized that non-conventional interactions would cause the interactor to perceive more disfluency in reading the narrative than conventional interactions would (H4). The results yielded no significant effect, and thus we reject the hypothesis. The absence of a significant effect might be explained by the fact that non-conventional media coupling and processing fluency have not been theoretically associated before. Perhaps, we made an incorrect inference between the concepts, although this seems intuitively unlikely. Another explanation could be that participants did not perceive the interactions as an integral part of reading the story. A successive study should investigate this relationship in a digital literary work where the media coupling is not manipulated in the buttons or cursor, but rather within the textual components.

Narrative engagement

Founded on the well-researched link between mental models and narrative engagement (Bilandzic et al., 2019), we expected that adding a semantically meaningful modality would increase levels of narrative engagement. Thus, we hypothesized that interpretation of manipulation figures would enhance narrative engagement through applying and strengthening mental models (H5). The results showed similar significant effects for manipulation figures interpretation on narrative engagement stemming from semantic coupling and stemming from media coupling. That is, if the participant had higher ratings of manipulation figures interpretation, they scored slightly higher on the narrative engagement scale as well. Due to the seemingly small effect, the practical importance of this finding could be questioned. In conclusion, we do not reject the hypothesis.

Various studies on the effect of processing fluency on narrative engagement suggested that perceived disfluency would lead to a decrease in narrative engagement (Busselle & Bilandzic, 2008; Walter et al., 2020). On the other hand, disfluency has been found to stimulate deeper processing (i.e. System 2) (Alter, 2013), making it a desirable difficulty (Pieger et al., 2018). We proposed that these different findings were the product of different types of processing fluency at play. Therefore, we hypothesized that for narrative-congruent interactions, perceived disfluency emerging from non-conventional interactions would lead to higher narrative engagement than perceived disfluency emerging from conventional interactions would. Continuing, for narrative-incongruent interactions, perceived disfluency emerging from non-conventional interactions would lead to lower narrative engagement than perceived disfluency emerging from conventional interactions would (H6). Out of the four separate analyses, only the one concerning the narrative-congruent conventional condition provided a significant result. Therefore, we cannot compare the effects, rejecting the hypothesis based on inconclusive findings. It is important to note that these correlations were heavily underpowered, which is discussed to a greater extent in the limitations section. As an implication, the chance of having a Type II error was increased, where we would fail to obtain a statistically significant effect even if there is an effect in reality (UCLA: Statistical Consulting Group, n.d.).

The results from the mediation analyses however, showed similar significant effects for perceived disfluency on narrative engagement stemming from semantic coupling and stemming from media coupling. Again, the effect sizes seem small. That is, if the participants perceived reading the narrative as less disfluent, they were slightly less engaged with the narrative. Surprisingly, this result contradicts previous findings by Walter et al. (2020), confirming our presumptions that deeper processing could enhance the construction of mental models. Even though the effect is small, future research should further explore the relation between perceived disfluency and narrative engagement, and the factors that determine its direction.

Finally, we hypothesized that narrative-congruent interactions would lead to higher narrative engagement than narrative-incongruent interactions would (H7), and that non-conventional interactions would lead to higher narrative engagement than conventional interactions would (H8). In both mediation analyses, the total effects did not yield a significant result, causing us to reject these hypotheses. In the mediation analyses, both the indirect effects and the direct effects were non-significant. That is, the effect of semantic coupling and media coupling on narrative engagement was not significant, whether we took into account the mediators or not. Since the directions of the direct paths for perceived disfluency were opposite to the directions of the effects of manipulation figures, it is not surprising that there is no net indirect effect. As for the direct effect between couplings and narrative engagement, perhaps the manipulated differences between the conditions were too small to affect narrative engagement.

Limitations

Before discussing how the current study could have been improved, it is important to note that its objectives were accomplished, by contrasting four versions of a digital literary work on semantic coupling and media coupling, and comparing their effects on narrative engagement mediated through manipulation figures interpretation and perceived disfluency. The exploratory analyses yielded promising insights into the potential of designing for manipulation figures, while the main results occasionally showed non-significant effects. Aside from the possibility that some relations do not exist indeed, several limitations could explain these insignificant findings.

Above all, the exploratory nature of this study has its constraints. In the theoretical framework, we bridged large fundamental gaps between theories that had not been linked before. Even though the hypotheses were well reasoned based on existing psychological theories, the current setup was perhaps too broad to detect small differences. All findings that did yield significant results were consistent with the direction of the hypotheses. Additionally, designing the stimuli was a challenging task, as the theory had to be applied appropriately to the digital literary work. Although we conducted a pilot study, the design did not perfectly translate the discussed theories. Moreover, some aspects of the work that were not specifically designed for, might have led to unintended consequences.

Previously, we mentioned some of the obstacles we faced in creating the digital literary work. Both semantic coupling and media coupling turned out to be difficult to implement. One of the reasons for this, is the chosen medium. In computer-based interactions, the gesture is limited to the mouse and keyboard. However, literature on manipulation figures often discusses gestures in the form of touch as well (Saemmer, 2015). The SUM "scratch" for instance, simulates the natural act of scratching an itchy skin with your fingers. On the other hand, the act of moving a mouse in itself does not represent a real-life interaction. In turn, interpreting manipulation figures may be psychologically quite different for mouse-based gestures with respect to touch-based gestures. As a consequence, the current study is limited in its findings and cannot be generalized across media.

Another limitation in the current study is due to technological restrictions. Normally, when hovering over a button, the cursor changes into a hand-icon to indicate its clickability (Codecademy, n.d.). However, in this specific digital literary work, the cursor one sees on-screen is not their original cursor. Due to safety reasons, JavaScript cannot alter movements of the real pointer. Therefore, the digital work hides the original pointer and instead shows the interactor a fake one. Consequently, there is non-conventionality in all four conditions, where the cursor does not fit the perceived affordance of the button. Hence, the extent to which the conventional conditions were indeed conventional may be questioned.

Earlier, we already stumbled upon the question of when a SUM could be perceived as incongruent with the textual content. In this study, we deliberately chose to digitize four versions of one existing narrative, to control for variance. According to Bouchardon (2014), the SUM only takes on its full meaning when considering the whole narrative. Therefore, the incongruent placement of the SUMs could never have been fully incongruent in the current setup. A research through design approach could further investigate these requirements and inform on design decisions. Furthermore, the SUMs were applied to the mouse movements and buttons, but not to elements inherent to the narrative itself. Although this was a conscious decision at the time, it unintentionally transpired to cause distraction. According to Gao et al. (2019), there is an optimal balance between content that can be processed fluently, and content that benefits from disfluent processing. Perhaps, buttons and mouse movements should stick to conventional affordances, applying SUMs to the core of the narrative.

As for unintended consequences, the typography settings may have influenced perceived disfluency. In Twine, most of the standard CSS settings were unaltered (i.e. font, color, spacing), except for font size and alignment. Since the interface was responsive, participants interacting with the narrative on a larger screen saw more words on one line, thus crossing a larger distance in starting with the consecutive line of text. Perhaps, some of these settings caused unintended perceived disfluency. Of course, reading a text on screen is already quite different from reading a text on paper. For example, some people prefer to follow the lines with their finger to guide their eyes. On the computer, one could use their cursor, but when the cursor moves non-conventionally, this provides difficulty rather than ease.

Lastly, it is important to note that the a priori sample size determination discussed in the method section, did not necessarily suit the analyses performed in the current study. The calculation was performed before altering the types of analyses, and was not revised afterwards. The current paragraph examines the impact of this error. Since the main analyses mostly consisted of mediation analyses, the F-test calculation should have followed the linear multiple regression model. With two predictor variables per test, a medium effect size ($f^2 = .15$), an alpha of .05, and power set at .80, the sample size estimation resulted in 68 participants per analysis. Since we used all participants in each separate mediation analysis, a total of 68 participants was required. Luckily, this number is well below the obtained number of participants ($N = 131$). Moreover, hypothesis 6 was analyzed with four separate Pearson correlations. In G*power, an exact correlation a priori power analysis with a medium effect size ($\rho =$ .30), an alpha of .05, and power set at .80, resulted in 84 participants per analysis. However, we obtained between 32 and 34 participants per analysis. Thus, these analyses were heavily underpowered.

Future research

As discussed in the previous section, the current work has its limitations, which should be accounted for in creating any future work. First and foremost, we suggest future research to repeat the current study with a different digital literary work that is touch-based. The potential of digital literature however, lies not in its current exploitations, but in how it develops alongside changing technologies. In the field of Natural Human-Computer interaction, technological developments focus on creating intuitive interactions where the interactor's prior knowledge is activated to minimize cognitive load (D'Amico, Del Bimbo, Dini, Landucci, & Torpei, 2010). As a result, the interface changes from mouse-based and touch-based gestures to bodily movements and tangible objects. It would be interesting to explore how these different types of gestures influence the interpretation of manipulation figures, perceived disfluency, and narrative engagement.

Conclusion

The current study examined the extent to which semantic coupling and media coupling influenced narrative engagement, and to what extent this relation was mediated by perceived disfluency and manipulation figures interpretation. Findings support the idea that non-conventional media coupling positively influences manipulation figures interpretation, as suggested in the article by Bouchardon (2014). In turn, manipulation figures led to a small increase in narrative engagement. The other hypotheses were not supported by the main analyses, but exploratory findings suggest that there is more to it. Therefore, designers are encouraged to continue experimenting with unexpected combinations. Future research should investigate implications of the current framework for touch-based literary works, or perhaps even bodily movements or tangible objects as input.

From a practical perspective, the current research aimed to investigate whether designing for manipulation figures makes digital narratives more engaging, which could create an interest in literature among the younger generation. Growing up in the digital era, it may be challenging to concentrate on reading printed works of literature that are not as addictive as digital applications are. Utilizing new media characteristics, digital literature could serve educational purposes in a more engaging way.

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Appendix A

This section contains the original scales adopted in the current study.

The Narrative Engagement Scale (Busselle & Bilandzic, 2009)

Narrative Understanding:

1. Narrative realism: At points, I had a hard time making sense of what was going on in the program.
2. Cognitive perspective-taking scale: My understanding of the characters is unclear.
3. Ease of cognitive access: I had a hard time recognizing the thread of the story.

Emotional Engagement:

4. Empathy: The story affected me emotionally.
5. Empathy: During the program, when a main character succeeded, I felt happy, and when they suffered in some way, I felt sad.
6. Empathy: I felt sorry for some of the characters in the program

Attentional focus:

7. Distraction: I found my mind wandering while the program was on.
8. Distraction: While the program was on I found myself thinking about other things.
9. Distraction: I had a hard time keeping my mind on the program.

Narrative presence:

10. Narrative presence: During the program, my body was in the room, but my mind was inside the world created by the story.
11. Narrative presence: The program created a new world, and then that world suddenly disappeared when the program ended.

12. Narrative presence: At times during the program, the story world was closer to me than the real world.

The 5-item Fluency Experience Scale (Graf et al., 2018)

A semantic differential scale with the endpoints:

difficult to *easy*

unclear to *clear*

disfluent to *fluent*

effortful to *effortless*

incomprehensible to *comprehensible*

Appendix B

This section contains the complete questionnaire (in Dutch), which was equal for all participants in the current study.

1. Ik heb het toestemmingsformulier gelezen en ik ga akkoord.

   O Akkoord   O Niet akkoord

   Indien de participant niet akkoord invulde, werd het onderzoek stopgezet.

   Onderstaande vragen verifiëren of je geschikt bent voor deelname aan dit onderzoek.

2. Heb je dyslexie?

   O Ja, ik heb dyslexie.   O Nee, ik heb geen dyslexie.

   Indien de participant ja invulde, werd het onderzoek stopgezet.

3. Is Nederlands je moedertaal?

   O Ja, Nederlands is mijn moedertaal.   O Nee, Nederlands is niet mijn moedertaal.

   Indien de participant nee invulde, werd het onderzoek stopgezet.

4. Voer je dit onderzoek uit op een computer of laptop?

   O Ja, ik voer dit onderzoek uit op een computer/laptop.   O Nee, ik voer dit onderzoek niet uit op een computer/laptop.

   Indien de participant nee invulde, werd het onderzoek stopgezet.

5. Wat is je leeftijd?

   ....

6. Met welk geslacht identificeer je je?

   O Man   O Vrouw   O Anders

7. Wat is je hoogst afgeronde opleiding?

   O Middelbare school   O MBO   O HBO   O Universitaire bachelor   O Universitaire master of hoger

Hierna werd de participant willekeurig toegewezen aan één van de vier condities. Na het lezen van het verhaal keerde de participant terug naar de vragenlijst.

Beantwoord onderstaande stellingen met betrekking tot het verhaal dat je zojuist hebt gelezen.

8. Op bepaalde momenten had ik moeite met te begrijpen wat er in het verhaal gebeurde.

   O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

9. Ik had moeite met het begrijpen van de personages.

   O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

10. Ik had moeite met de rode draad uit het verhaal te halen.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

11. Ik werd geraakt door het verhaal.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

12. Wanneer de personages in het verhaal iets goeds overkwam, voelde ik me ook goed en wanneer de personages iets slechts overkwam, voelde ik me ook slecht.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

13. Ik had medelijden met de personages in het verhaal.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

14. Terwijl ik het verhaal las, merkte ik dat ik een beetje aan het wegdromen was.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

15. Terwijl ik het verhaal las, merkte ik dat ik over andere dingen dan het verhaal aan het nadenken was.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

16. Ik had moeite met mijn gedachten bij het verhaal te houden.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

17. Tijdens het lezen was ik lichamelijk wel aanwezig in de ruimte, maar zat ik met mijn hoofd helemaal in de wereld van het verhaal.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

18. Het verhaal heeft een soort van nieuwe wereld voor mij gecreëerd, maar toen het verhaal was afgelopen, was deze nieuwe wereld ook weer verdwenen.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

19. Het verhaal stond soms dichter bij me dan de werkelijkheid.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

20. Hoe heb je het lezen van het verhaal ervaren?

	1	2	3	4	5	
moeilijk	○	○	○	○	○	makkelijk
onduidelijk	○	○	○	○	○	duidelijk
niet vloeiend	○	○	○	○	○	vloeiend
moeizaam	○	○	○	○	○	moeiteloos
onbegrijpelijk	○	○	○	○	○	begrijpelijk

Beantwoord onderstaande stellingen met betrekking tot het verhaal dat je zojuist hebt gelezen.

21. Terwijl ik het verhaal las, interpreteerde ik niet alleen de tekst, maar ook de muisbewegingen.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

22. Tijdens het lezen interpreteerde ik de muisbewegingen in de context van het verhaal.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

23. Op bepaalde momenten droegen de muisbewegingen bij aan de betekenis van het verhaal.

    O Sterk mee oneens O Oneens O Neutraal O Eens O Sterk mee eens

24. Terwijl ik het verhaal las, interpreteerde ik niet alleen de tekst, maar ook de “volgende” knop.

    O Sterk mee oneens   O Oneens   O Neutraal   O Eens   O Sterk mee eens

25. Tijdens het lezen interpreteerde ik de “volgende” knop in de context van het verhaal.

    O Sterk mee oneens   O Oneens   O Neutraal   O Eens   O Sterk mee eens

26. Op bepaalde momenten droeg de “volgende” knop bij aan de betekenis van het verhaal.

    O Sterk mee oneens   O Oneens   O Neutraal   O Eens   O Sterk mee eens

    Onderstaande vragen gaan over de passages van het verhaal waarbij de “volgende” knop zich **niet** statisch onder de tekst bevond.

27. Waren de muisbewegingen in lijn met je verwachtingen?

    (Bijvoorbeeld: als ik de muis naar links beweeg, verwacht ik dat de muis op het scherm ook naar links beweegt.)

    O Ja, de muisbewegingen op het scherm waren in lijn met mijn verwachtingen.   O Nee, de muisbewegingen op het scherm waren niet in lijn met mijn verwachtingen.

28. Kwam de weergave van de “volgende” knop overeen met de context van de desbetreffende passage van het verhaal?

    O Ja, de weergave van de “volgende” knop kwam overeen met de context van de desbetreffende passage van het verhaal.   O Nee, de weergave van de “volgende” knop kwam niet overeen met de context van de desbetreffende passage van het verhaal.

    Onderstaande vragen controleren of jouw deelname serieus was. Gelieve naar waarheid in te vullen.

29. Heb je het verhaal volledig gelezen?

    O Ja, ik heb het verhaal volledig gelezen.   O Nee, ik heb het verhaal niet volledig gelezen.

30. Wat was de naam van de vis?

    O Atlantis O Blub O Bubbel O Jona O Vin

31. Waarom was Tobi van streek?

    O Zijn dochter was niet thuisgekomen. O Zijn moeder was overleden. O Zijn vader was vreemdgegaan. O Zijn vis was ziek. O Zijn vriendin had het uitgemaakt.

32. Kende je dit verhaal al?

    O Ja, ik kende dit verhaal al. O Nee, ik kende dit verhaal nog niet.

    Indien de participant nee invulde, werden vraag 33 en 34 overgeslagen.

33. Weet je wie dit verhaal heeft geschreven?

    O Ja, ik weet wie de schrijver is. O Nee, ik weet niet wie de schrijver is.

    Indien de participant nee invulde, werd vraag 34 overgeslagen.

34. Hoe heet de schrijver van dit verhaal?

    ....

35. Je hebt de eerste passage gelezen van het korte verhaal “De vis in de fles” door Thomas Olde Heuvelt. Zou je graag de rest van dit verhaal lezen?

    O Ja, ik denk dat ik het verhaal verder ga lezen. O Nee, ik denk niet dat ik het verhaal verder ga lezen.

Appendix C

This section contains three plots on the distribution of narrative engagement, by semantic coupling, media coupling, and perceived disfluency.

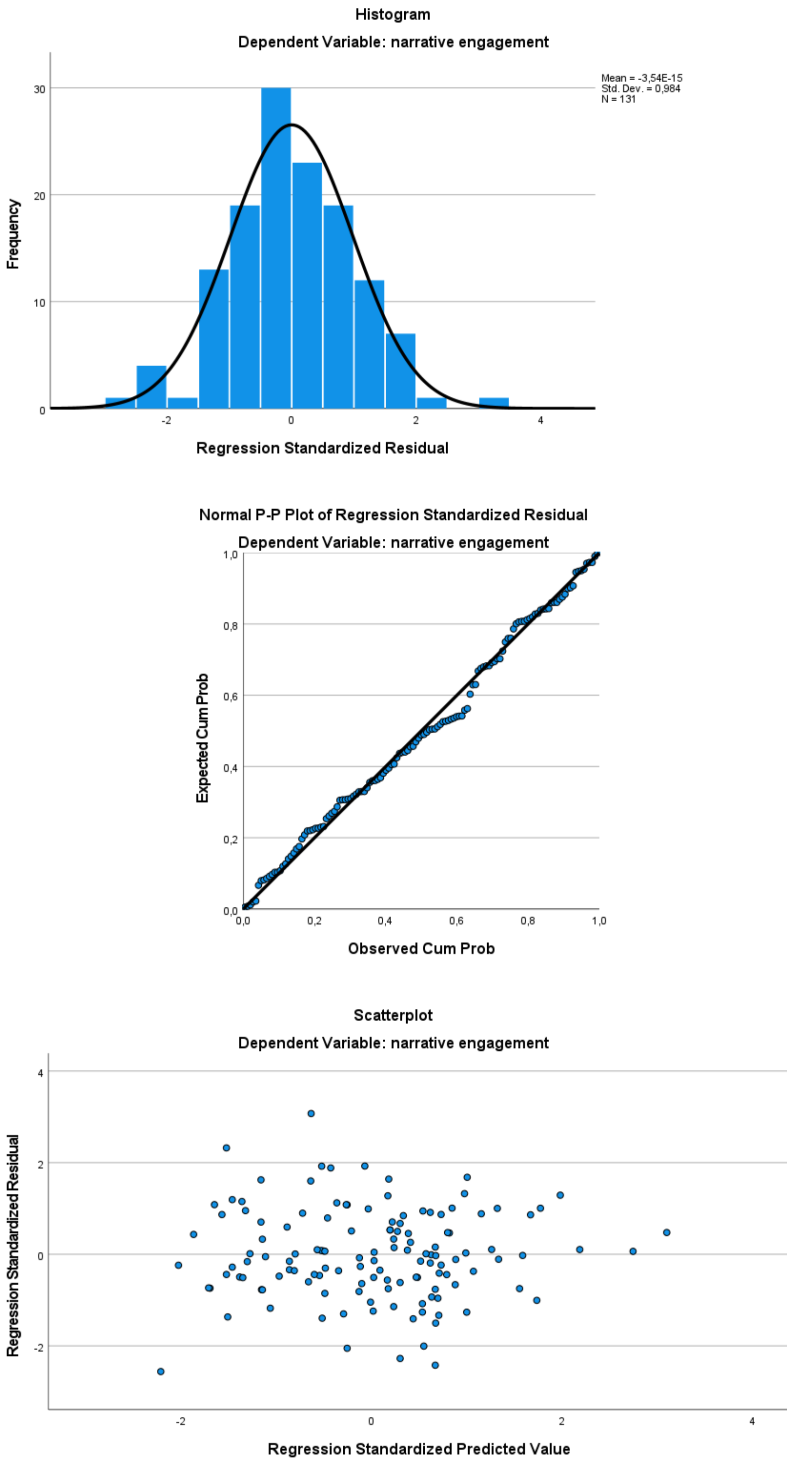

Figure 6. The histogram, the normal P-P plot, and the scatterplot of standardized residuals to check assumptions of homogeneity of variance and linearity.

Appendix D

This section contains additional information on the exploratory analyses.

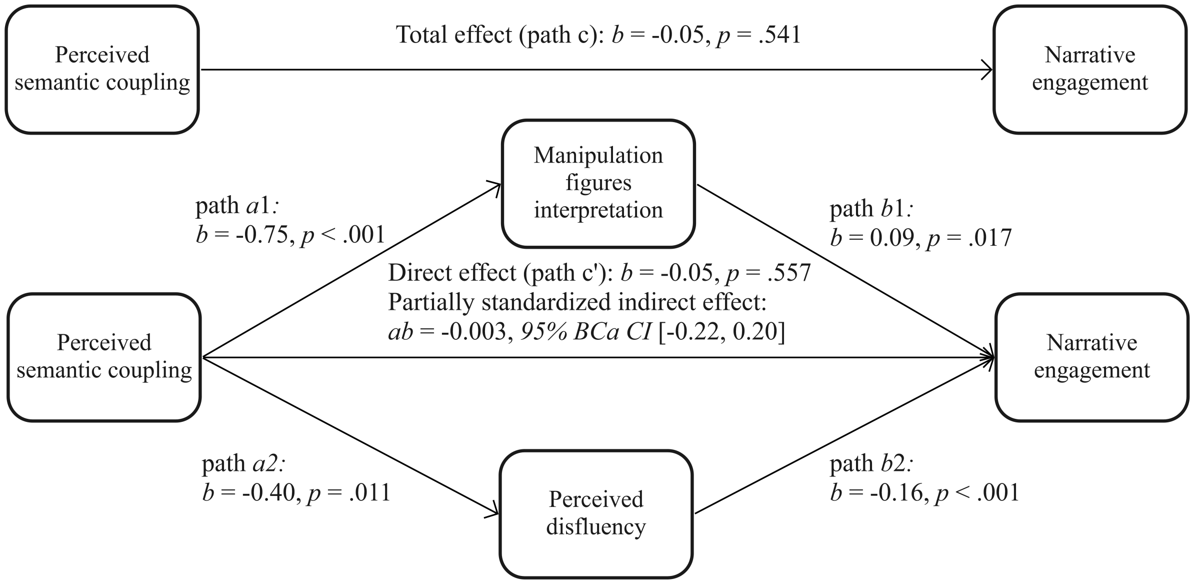

Figure 7. The effect of perceived semantic coupling on narrative engagement, mediated by manipulation figures interpretation and perceived disfluency.

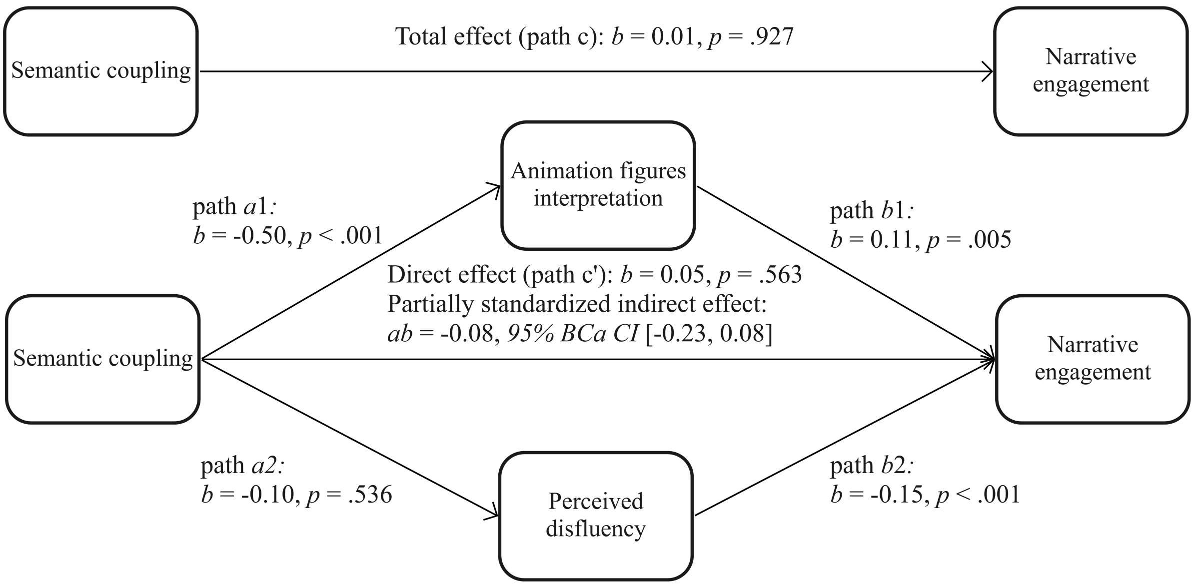

Figure 8. The effect of semantic coupling on narrative engagement, mediated by animation figures interpretation and perceived disfluency.

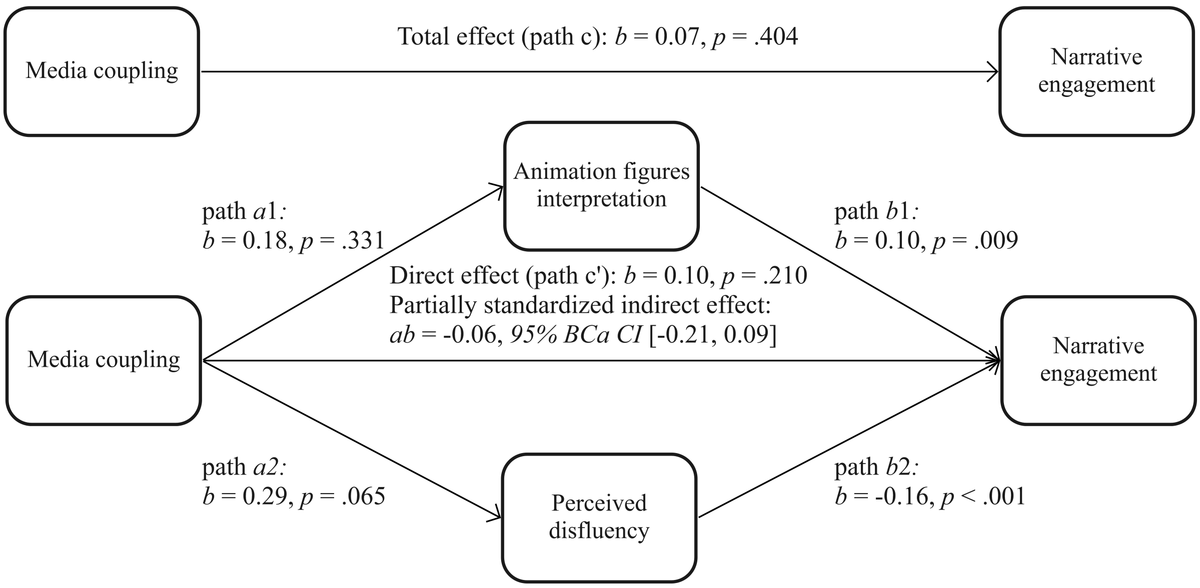

Figure 9. The effect of media coupling on narrative engagement, mediated by animation figures interpretation and perceived disfluency.